PATENT SPECIFICATION

DRAWINGS ATTACHED

826,706

Date of Application and filing Complete Specification: *June* 4, 1957.

No. 17719/57.

Application made in United States of America on *August* 6, 1956.

Complete Specification Published January 20, 1960.

Index at Acceptance: Class 14(2), E1.
International Classification: C12h.

Improvements in or relating to the treatment of beer.

COMPLETE SPECIFICATION

We, AMERICAN TANSUL COMPANY, a Corporation of California, of San Francisco, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to the treatment of beer with a view to improving its stability, appearance and foaming characteristics and preventing the formation of haze upon repeated chilling or after agitation during transportation.

According to the invention, the method for treating beer comprises the addition of a reducing agent in the form of 5-25 parts by weight of gaseous sulphur dioxide per million parts of beer after the beer has fermented and before finishing.

The term "finishing" as used in this specification means the processing which occurs immediately prior to packaging and which, in conventional practice, comprises additonal carbonisation of the beer and a final filtration.

In the preferred method, a stabilising agent in the form of a slurry or colloidal clay of the montmorillonite family and a proteolytic enzyme is added to the beer after fermentation and before the addition of the sulphur dioxide.

The function of the clay is to remove certain of the long chain protein molecules in the beer by adsorption. The enzyme serves to digest other molecules of the proteins.

There are several functions performed by the reducing agent. One important function is the agglomeration or precipitation and flocculation of the clay into a compact sludge. Compacting of the sludge reduces the quantity of the beer entrapped therein and therefore improves the yield. Also, the more compact and grain-like the sludge, the more readily it can be filtered, resulting in a reduction of the amount of work to be done by the filters.

Another function of the reducing agent is to prevent oxidation of the beer during storage prior to consumption and even to reverse some of the oxidation which has taken place during fermentation of the beer. A still further function of the reducing agent is to enhance the digestion of the protein by the proteolytic enzyme.

The nature of the present improvement is emphasised when it is understood that heretofore the reducing agent has been provided in the form of a liquid or dry material, such as sodium or potassium metabisulphite.

In accordance with the teaching of the present invention, free, fresh, new sulphur dioxide is introduced into the beer in gaseous form preferably after a stabiliser clay and enzyme have been introduced and prior to the settling steps during which the clay settles out of the beer.

Several advantages accrue from the treatment according to the invention.

The quantitative addition of the gaseous reducing agent is more accurate to control than hitherto and thus a better and more stable end product can be obtained. Oxidation is effectively prevented and in fact some of the oxidation which has taken place previously during fermentation and prior treatment is reversed.

No sodium or other foreign substance need be added to the beer along with the active sulphur dioxide as is the case with sodium or potassium metabisulphite. Further, the present invention enables more economic and better controlled production of beer than heretofore.

As aforementioned, it is preferred to add a stabiliser of the montmorillonite family, such as the mineral Hectorite, which is a gel-like colloidal clay of that family comprising a colloidal magnesium lithium silicate, and an enzyme in compatible proportions.

(Price 3s. 6d.)

The enzyme and Hectorite are mixed with water to form a slurry or slurries which are added to the beer in one or more stages. However, it is preferred not to add reducing agent at the same time that the stabiliser is added, because the reducing agent acts upon the clay to precipitate it before it has had an opportunity to adsorb the long chain protein molecules from the beer.

Other gel-like colloidal clays of the montmorillonite family which can be used include bentonite, nontronite, saponite, sepiolite and beidelite. The stabilizing agent may be employed without a mineral additive, the sulphur dioxide being used as a precipitant and/or antioxidant.

The quantity of clay added to the beer varies, depending on the length of time which the beer is allowed to stand or settle after the clay is added, it being understood that the longer the settling time, the less the quantity of clay which must be added. If the beer is to be allowed to settle between six and nine days, then six to nine pounds of Hectorite per one hundred barrels of beer are preferably employed. If the settling time is between ten and fifteen days, then five to seven pounds of Hectorite per hundred barrels is employed. If the beer is permitted to settle over fifteen days, then three to four pounds of Hectorite per hundred barrels are preferably employed.

Various proteolytic enzymes may be employed to enhance the keeping quality and other desired characteristics of the beer. A preferred enzyme is a mixture of the enzyme bromelin and the enzyme papain. The quantity of enzyme added is again dependent upon the length of time the beer is chilled or stored, the longer the time the less enzyme being required to accomplish the proper digestion. It is desirable that the enzyme be added at least five days before finishing. One preferred enzyme ingredient is 6000 units of enzymatic activity per one hundred barrels of beer of bromelin and between 500 and 1500 units of enzymatic activity per 100 barrels of beer of papain.

In accordance with this invention the reducing agent is gaseous sulphur dioxide as commercially obtainable. The gas is metered from 5 to 25 parts by weight per million of beer and preferably between 10 and 20 parts per million of beer.

Methods in accordance with the invention will now be described by way of example with reference to the accompanying drawing in which:

Figure 1 is a diagrammatic flow sheet indicating the method of the invention, and

Figure 2 is a flow sheet showing a modification of the method.

In carrying out the present invention the ingredients are added after the fermentation is completed and withdrawal from the yeast. An aqueous slurry of stabiliser clay of the montmorillonite family, such as Hectorite, and enzyme and water is injected into a line through which the beer is passing on its way from the cooler to the ruh or ageing tank. At some point along this line, preferably after the stabiliser and enzyme have been added but not necessarily so, as indicated in the drawing, gaseous sulphur dioxide is injected into the beer line, the flow of gas being controlled by the valve V. The beer is then chilled and left in a ruh or ageing tank for a period in excess of six days and even over fifteen days, depending upon the desire of the brewer. A sludge is formed at the bottom of the tank by precipitation of the colloidal suspension of the clay which initially forms in the settling tank. The gel adsorbs the long-chain protein molecules as it settles out, removing them from the beer. At the same time, the enzyme acts to digest some of the other proteins in the beer, which also settle out in the sludge. The sulphur dioxide mixes with the beer and helps to precipitate the Hectorite and to form a more compact and grainlike sludge in the settling tank. It further assists the enzyme in digesting the proteins in the beer during settling and also during pasteurisation because the enzyme is then heated and its activity is thereby increased. The sulphur dioxide also reverses some of the oxidation which has taken place in the beer during the fermentation process. However, all of the sulphur dioxide is not lost during the period, but remains in the beer and serves as an anti-oxidant scavenger for many weeks while the beer is in transport or storage prior to consumption and further reduces some of the oxidation which has taken place during the prior steps of manufacture.

Figure 2 illustrates the introduction of the sulphur dioxide gas after the ruh period instead of before it as in Fig. 1 but before finishing.

The essence of the invention is the employment of a metered gaseous sulphur dioxide in beer preferably after addition of stabilizing agent and before packaging in order to precipitate the stabilizer additive and to serve as any oxygen scavenger.

WHAT WE CLAIM IS:

1. A method of treating beer, comprising the steps of adding, after fermentation and before finishing, 5-25 parts by weight of gaseous sulphur dioxide per million parts of beer.

2. A method according to claim 1 in which 10 to 20 parts by weight sulphur dioxide are added per million parts of beer.

3. A method according to any preceding claim in which a stabiliser clay of the montmorillonite family is added in addition to the sulphur dioxide.

4. A method according to claim 3 where-

in the stabiliser clay is added before the sulphur dioxide.

5. A method according to claim 3 or claim 4 wherein the beer is allowed to stand after the addition of the stabiliser clay while the stabiliser forms a colloidal suspension and settles out while adsorbing the long chain protein molecules and the beer and sludge are separated before finishing.

6. A method according to any one of claims 3 and 5 in which the stabiliser is Hectorite.

7. A method according to any preceding claim wherein a proteolytic enzyme is added in addition to the sulphur dioxide and the beer is allowed to stand while the enzyme digests proteins released by the action of sulphur dioxide.

8. Beer treated by the method according to any preceding claim.

For the Applicants.
LLOYD WISE, BOULY & HAIG,
Chartered Patent Agents,
10 New Court, Lincoln's Inn,
London, W.C.2.

Sheerness: Printed for Her Majesty's Stationery Office, by Smiths, Printers and Duplicators.—1960
Published at the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

826,706 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

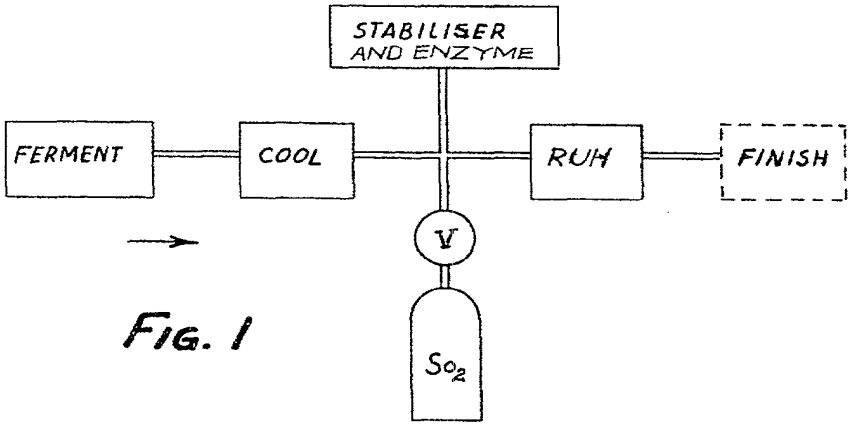

FIG. 1

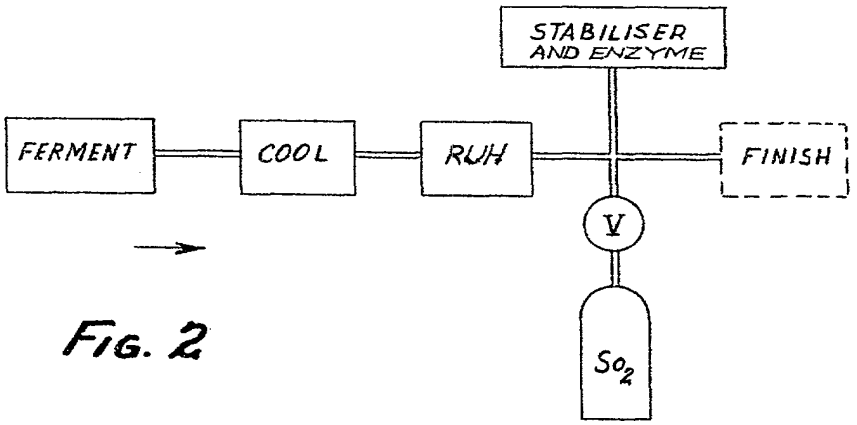

FIG. 2